



सत्यमेव जयते

Dept. of Science and Technology,
Govt. of India



IIT Roorkee

25-27 February,
2022

GEO-INNOVATION CHALLENGE

Challenge based Innovation in
Geospatial Science

A Virtual Event

To apply,
scan the QR code:



Organised By:

Geomatics Engineering Group,
Department of Civil Engineering,
IIT Roorkee

Supported By:

National Geospatial Program,
Dept. of Science and Technology,
Govt. of India, New Delhi.



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INDIAN INSTITUTE OF TECHNOLOGY, ROORKEE

Indian Institute of Technology, Roorkee is among the foremost of institutes of national importance in higher technological education and in engineering, basic and applied research. The Institute ranks amongst the best technological institutions in the world and has contributed to all sectors of scientific and technological development.

The Institute **will be celebrating its 175 years of existence in October 2021**. It was **converted to an IIT on September 21, 2001** by an Ordinance issued by the Government of India declaring it as the nation's seventh IIT.

The Institute offers Bachelor's Degree courses in **10 disciplines of Engineering and Architecture** and **Postgraduate's Degree in 55 disciplines** of Engineering, Applied Science, Architecture and planning. The Institute has facility for doctoral work in all Departments and Research Centres.



DEPARTMENT OF CIVIL ENGINEERING at IIT Roorkee is the oldest and the largest in the country. It was established on November 25, 1847 as Roorkee Civil Engineering College. The department has produced several eminent engineers who have made significant contributions in the planning and execution of Civil Engineering projects in India as well as abroad. The Department offers a four-year course leading to the Bachelors Degree in Civil Engineering and two-year courses leading to Master's degree in seven major specialisations of civil engineering (viz., Building Science and Technology, Environmental Engineering, Geomatics Engineering, Geotechnical Engineering, Hydraulics Engineering, Structural Engineering and Transportation Engineering). The research programmes of the department are funded by various agencies such as MHRD, Max Planck Society Germany, Japanese Ministry of Education, Culture, Sports, Science & Technology (MEXT), Department of Science & Technology (DST), ISRO, DRDO, etc. The faculty of the department continues to strive loftier by exploring new frontiers of knowledge, imparting the latest technical knowledge to the students and conducting high quality of research.

To know more, visit: <https://civil.iitr.ac.in/>



GEOMATICS ENGINEERING GROUP is known for its rich history as a knowledge epicentre of surveying techniques for Science and Civil engineering projects. Ranging from satellite-based measurements of Earth using optical, thermal, hyperspectral, laser and radar remote sensing to traditional surveying methods using Electronic Total Station (ETS), Global Position System (GPS), Unmanned Aerial Vehicles (UAVs), LiDAR, Terrestrial Laser Scanner (TLS), Ground Penetrating Radar (GPR), Spectroradiometers and Gravimeters, the group has capacities to solve important research problems including natural resources management, disaster management, earth surface deformation, glaciology and climate change, smart city 3D mapping, urban infrastructure development and many other research areas. The group comprises faculty members leading in technologies like Photogrammetry, Geographical Information System (GIS), GPS, Digital Image Processing, SAR Interferometry, Geodesy, Artificial Intelligence, Machine Learning and Cloud Computing. Apart from research, the group has a strong curriculum to impart Geomatics Engineering concepts to UG students, PG students and PhD scholars.

To know more, visit: <https://civil.iitr.ac.in/GEG/About>

WHAT IS GEO-INNOVATION CHALLENGE?

In India's recent journey of sustainable economic growth, knowledge has been identified as one of the key drivers. In this odyssey, India has adopted a new information regime through its '**Digital India**' program to support good governance, sustainable development goals and empowerment of its citizens. The challenges of this developmental path are inclusiveness, transparency, efficiency and productivity while balancing economic growth and sustainable development. Over the last three decades, geospatial technologies have proven to be an effective enabler to meet these challenges. Increasing g-governance and efficiency of the system, necessitates **innovation in geospatial technologies**. While there has been widespread adoption of geospatial technologies into various sectors, innovation brings economic and social value through the combination of geospatial technologies with artificial intelligence, IoT, big data, etc.

The proposed Geo-Innovation challenge is focused on innovation in Geospatial Science. Geospatial science encapsulates automated and semi-automated data fusion approaches to develop analysis ready datasets; visualization of data collected from internet of things (IoT), augmented and virtual reality, blockchain, and 3D printers; improvement of quality of data collected from variegated sources including error analysis and adjustment, dimensionality reduction, and statistical analysis of datasets; innovation in unmanned aerial vehicles (UAVs) including automated data mosaicking and georeferencing, operational nuisances, and feature extraction; innovation in GPS and GIS such as performance of GPS with low signals, improvement of GPS positioning, and data interoperability; and innovation in terrestrial laser scanner and LiDAR including data integration, cloud storage of optimized datasets.

OBJECTIVE

Geo-Innovation Challenge is a new program by the National Geospatial Program (NGP), Department of Science and Technology, Government of India, New Delhi to nurture innovation for national socio-economic developmental processes using geospatial technology. GeoInnovation is geared towards young professionals under the age of 35 years. For more information, visit: <http://dst-iget.in>

The objective of this Geo-Innovation challenge is to **recognize, encourage, and nurture geoinnovation in Geospatial Science**. This call invites young professionals under the age of 35 to submit their innovative ideas in the prescribed format that can address any of the sub-themes of the proposed Geo-Innovation mentioned below. The ideas will have to be presented to an eminent jury drawn from the industry, academia and premier research institutions. The three top innovative ideas will be awarded cash prizes and a certificate with an opportunity to be mentored in developing the idea into a full proposal/ business proposition.

First Prize: Merit Certificate + Rs. 12000/-

Second Prize: Merit Certificate + Rs. 8000/-

Third Prize: Merit Certificate + Rs. 5000/-

WHO CAN APPLY?

The three day Geo-Innovation Challenge is targeted at young professionals under the age of 35 years.

We encourage you to apply if you are:

- **35 years or below 35 years of age**
- have a **Doctoral Degree** from any recognised University.
- have **atleast one paper published** in SCOPUS/Web of Science indexed journals.

You will also be considered if you don't have a doctoral degree but **have relevant industry or field experience** and have an innovative original idea.

HOW TO APPLY?

STEP 1:

Interested candidates should first fill the application form available at: [Application Form](#)

Submit the following for step 1:

- **Abstract:** Abstract should be between 800-1000 words. Abstract should include the title, description of methods used for the proposed innovation, description of results, and keywords. Mention names of all authors along with email-ids and phone numbers.
- A copy of the **identification card of all author(s)** issued by your respective institutes.
- A **list of published paper(s)** of all authors.
- Apply at <https://dst-iget.in/Applicationsform/>. Please attach your abstract with the list of your published paper(s) and prepare a single pdf. Upload this single pdf when you choose the file to upload your published papers.

Send the above documents to geosp-chal@ce.iitr.ac.in

Abstracts will be reviewed by a panel of experts. The **best 25 abstracts will be shortlisted** by a panel of experts who will review the submitted abstracts.

STEP 2:

Shortlisted candidates will be invited to submit detailed proposals based on their selected abstracts. Proposals will be reviewed by a panel of experts through presentations (Online or Offline depending on the pandemic situation).

- The top three proposals will receive merit certificates and cash prizes.
- The top three proposals may be recommended to DST for funding support.

What are the themes and sub-themes for submitting the abstracts?

Main Theme: CHALLENGE BASED INNOVATION IN GEO-SPATIAL SCIENCE

Sub-Theme 1: Data Fusion Approaches

- ANALYSIS READY DATASETS

On many occasions, end-user is only concerned with datasets that can provide meaningful insights without the hassle of pre-processing. Innovation is to combine different geospatial datasets in a single framework to produce datasets that are ready for analysis

- HRS DATA FUSION

Hyperspectral Remote Sensing (HRS) refers to data at near individual bands. Innovation is to analyze and extract meaningful insights from HRS data from different sources at different bands.

- AUTOMATED AND SEMI-AUTOMATED APPROACHES

Innovation is to develop frameworks of automated and semi-automated data fusion approaches.

Sub-Theme 2: Data Visualization

- INTERNET OF THINGS (IoT)

Innovation in ways to use and visualize geospatial datasets collected from Internet of Things (IoT).

- AUGMENTED REALITY & VIRTUAL REALITY

Innovation is visualization of geospatial information associated with physical objects and their locations using Augmented Reality (AR) and Virtual Reality (VR).

- BLOCKCHAIN

Innovation is to use Blockchain for proper book-keeping of geospatial information associated with physical objects to avoid theft and duplication of geospatial data.

- 3D PRINTING

3D Printing of topographical maps, DEM and DSM.

Sub-Theme 3: Data Quality Improvement

- DATA SOURCES AND ITS INTEGRITY

Integrity of different sources of geospatial datasets. Innovation is new ways to collect geospatial datasets and improvement in older techniques to collect such datasets with integrity.

- COLLECTION, CONVERSION, AND STORAGE TECHNIQUES

Innovation is how collected datasets are converted to the correct format and stored in a way for faster retrieval by different software or written codes.

- ERROR ANALYSIS AND ADJUSTMENTS

An important element of stored datasets is that they are error-free or adjusted to the correct reference frame. Innovation is to introduce adjustments to reduce error of stored datasets without changing their meaning.

- HIGH DIMENSIONALITY REDUCTION OF DATA

Collected datasets could be of more than 3 dimensions. Innovation is to use new ways to reduce the dimensions of the datasets without affecting their statistical properties.

- STATISTICAL ANALYSIS

Innovation will be examined on the use of new and conventional statistical methods to extract meaningful information from geospatial datasets.

- HIGH RESOLUTION DEM AND DSM GENERATION

Many geospatial datasets collected refer to ground elevation. Innovation is how to collect and store high-resolution elevation datasets with integrity.

Sub-Theme 4: Unmanned Aerial Vehicles (UAVs)

- AUTOMATED DATA MOSAICING AND GEOREFERENCING

UAV collects large amounts of digital images in a short period of time. Innovation is automated data mosaicking and automated georeferencing of UAV images on the fly.

- BIG UAV DATA ANALYSIS IN NEAR REAL-TIME

UAV produces Big Datasets. Innovation is to analyse quality of images on the fly in order to modify flight plan of UAV.

- OPERATIONAL NUISANCES

Operational nuisances refer to battery failure, short amounts of current flight times, optimizing payloads to increase flight time, return home feature upon breakage of any UAV component. Innovation is addressing all such issues.

- FEATURE EXTRACTION

UAV collects high resolution images. Innovation is to extract point, line, and polygon features on the fly.

Sub-Theme 5: GPS And GIS

- PERFORMANCE OF GPS WITH LOW SIGNALS

Innovation is to develop methods to retrieve coordinates using low GPS signals in urban and canopy areas.

- ACCURACY IMPROVEMENT OF GPS POSITIONING

Improvement of locational accuracy using GPS positioning.

- INTEROPERABILITY OF VARIOUS DATA IN GIS

The ability of computer systems or software to exchange and make use of information available in different formats collected/generated by various tools for the purpose of using them in an integrated way.

Sub-Theme 6: TLS And LIDAR

- DATA INTEGRATION

UAV collects large amounts of digital images in a short period of time. Innovation is automated data mosaicking and automated georeferencing of UAV images on the fly.

- ERROR ANALYSIS

Innovation is to remove errors from TLS and LiDAR data before performing data fusion.

- 3D PRINTING

3D Printing of TLS and LiDAR based products.

- CLOUD OPTIMIZATION

Innovation is to host big datasets from TLS and LiDAR on cloud to be rendered by users,

IMPORTANT INFORMATION

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| Last Date of Abstract Submission: | January 10, 2022 |
| Submission of abstract and supporting documents: | geosp-chal@ce.iitr.ac.in https://dst-iget.in/Applicationsform/ Please read 'How To Apply' section. |
| Acceptance of Abstract: | January 20, 2022 |
| Last date for submission of detailed proposal: | February 10, 2022 |
| Dates of presentation of detailed proposal: | February 25-27, 2022 |
| Mode of Conduct: | Online/Offline (depending on pandemic situation) |
| No. of Seats: | 25 |
| Registration Fees: | Nil |
| For any queries, contact: | geosp-chal@ce.iitr.ac.in |

PANEL OF EXPERTS

Prof. B.K. Mohan,
CSRE,
IIT Bombay

Dr. Sameer Saran,
IIRS,
Dehradun

Dr. Ravi Gupta,
CEO,
Elets Technomedia Pvt. Ltd.

Dr. Anil Kumar,
IIRS,
Dehradun

Dr. Rajesh Mathur,
ESRI

Dr. Shubha Pandey,
DST

Shri P.L.N. Raju,
North-Eastern Space Applications Centre

CERTIFICATE

An e-certificate will be awarded to each participant after the successful participation in geo-innovation challenge.